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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/558,271

10/16/2006

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EXAMINER

VALENTINE, JAMI M

ART UNIT

PAPER NUMBER

2815

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DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/558,271	<b>Applicant(s)</b> TATSUMI ET AL.	
	<b>Examiner</b> JAMI M. VALENTINE	<b>Art Unit</b> 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 07 February 2008.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 4-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 November 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>11/28/05, 12/19/05</u> .                                      | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. **Claims 1-20** are pending in this application. Applicant's election **without** traverse of Group I (Claims 1-3) in the reply filed on 2/7/08 is acknowledged. **Claims 3-17** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking claim. The requirement is deemed proper and is therefore made FINAL. **Claims 1-3** are examined in this Office action.

### ***US National Phase of PCT***

2. Acknowledgment is made that this application is the US national phase of international application **PCT/JP04/01079** filed 3 February 2004 which designated the U.S. and claims benefit of JP 2003-040730, filed 19 February 2003.

### ***Foreign Priority***

3. Acknowledgment is made that the certified copy of the foreign priority document has been received in the national stage application from the International Bureau.

### ***Information Disclosure Statement***

4. Acknowledgment is made that the information disclosure statement has been received and considered by the examiner. If the applicant is aware of any prior art or any other co-pending applications not already of record, he/she is reminded of his/her duty under 37 CFR 1.56 to disclose the same.

### ***Drawings***

5. The drawings are objected to because figures 6A-B, 8A-D, 9A-D and 14A-D are informal. Specifically, the shading used in the figures makes it difficult to discern the features. This problem will be exacerbated in future reproductions. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

6. The abstract of the disclosure contains a spelling error (i.e. Problemsp). Appropriate correction is required.
7. Paragraph [0025], (page 13, line 22) contains a spelling error (i.e. FfO<sub>2</sub>). Appropriate correction is required.

***Claim Objections***

8. Claim 1 contains a spelling error (i.e. “meal oxide”). Appropriate correction is required.

***Claim Rejections - 35 USC § 102/103***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that forms the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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12. **Claims 1 and 3** are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Nishiyama et al. (US Patent Application Publication No 2003/0218223) hereinafter referred to as Nishiyama in view of Visokay

13. Per **Claim 1** Nishiyama discloses a device (e.g. figure 1), comprising a MIS-FET including:

- a silicon substrate; (10)
- an insulating film (e.g. (16) or (14)) formed on said silicon substrate and containing silicon and at least one of nitrogen and oxygen; [0085] and [0113]
- a metal oxide film (12) formed on said insulating film and containing silicon and hafnium; and [0081]
- a gate electrode (13) formed on said metal oxide film,

14. The limitation regarding the silicon molar ratio is inherently disclosed since Nishiyama teaches that the metal oxide film (12) can be HfSiOx.

15. “The PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. In re Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). See MPEP 2112 [R-3] V.

16. In the case where inherency is not found, the claims are obvious in view of Visokay et al (US Patent Application Publication No 2003/0045080) hereinafter referred to as Visokay.

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17. Visokay teaches the use of the material  $\text{Hf}_x\text{Si}_{1-x}\text{O}_2$ , where  $0 \leq x < 1$  as a metal oxide gate dielectric [0012]. This material satisfies the limitation of a silicon molar ration ( $\text{Si}/(\text{Si} + \text{Hf})$ ) in the metal oxide film between 2% and 15%.

18. All of the component parts are known in Nishiyama and Visokay. The only difference is the combination of the old elements into a single device, by using the  $\text{Hf}_x\text{Si}_{1-x}\text{O}_2$  materials of Visokay in the MISFET device of Nishiyama. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the  $\text{Hf}_x\text{Si}_{1-x}\text{O}_2$  materials of Visokay in the MISFET device of Nishiyama in order to achieve the predictable result of providing high dielectric constant material (higher than a silicon oxide, as specified in Nishiyama [0081]). Additionally, it would have been obvious to a person of ordinary skill in the art to try the  $\text{Hf}_x\text{Si}_{1-x}\text{O}_2$  materials of Visokay in an attempt to provide a high dielectric constant material, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp. This is particularly evident since Nishiyama specifically names  $\text{HfSiO}_x$  as an acceptable material. *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007).

19. Per **Claim 3**, Nishiyama discloses the device of claim 1, including a silicon nitride film on said metal oxide film. [0113]

20. **Claim 2** is rejected under 35 U.S.C. 103(a) as obvious over Nishiyama in view of Kinoshita. (US Patent No 6,780,708) hereinafter referred to as Kinoshita

21. Per **Claim 2**, Nishiyama discloses the device of claim 1, but doesn't not explicitly teach where the metal oxide film includes polycrystalline particles having diameters of not smaller than 30 nm and smaller than 100 nm

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22. Kinoshita teaches that polycrystalline and nanocrystalline forms of hafnium silicate were known at the time the invention was made. (column 8 line 51 through column 9 line 10)

23. All of the component parts are known in Nishiyama and Kinoshita. The only difference is the combination of the old elements into a single device, by using the nanocrystalline hafnium silicate material of Kinoshita in the MISFET device of Nishiyama. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the nanocrystalline hafnium silicate material of Kinoshita in the MISFET device of Nishiyama in order to achieve the predictable result of providing high dielectric constant material (higher than a silicon oxide, as specified in Nishiyama [0081]). Additionally, it would have been obvious to a person of ordinary skill in the art to try the nanocrystalline hafnium silicate material of Kinoshita in an attempt to provide a high dielectric constant material, as a person with ordinary skill has good reason to pursue the known options within his or her technical grasp. *KSR International Co. v. Teleflex Inc.*, 550 U.S.--, 82 USPQ2d 1385 (2007).

***Cited Prior Art***

24. The following prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Reference 1: Wilk et al., "Electrical properties of hafnium silicate gate dielectrics deposited directly on silicon" *Applied Physics Letters* 74, 2854 (1999).



***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jami M. Valentine, Ph.D. whose telephone number is (571) 272-9786. The examiner can normally be reached on Mon-Thurs 9:00am-6pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Jami M Valentine, Ph.D.  
Examiner  
Art Unit 2815

/JMV/  
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